APPENDIX A

TEST PIT LOGS

Test Pit TP-1

0.0 to 2.0 ft Medium stiff, black clayey SILT; highly expansive.
2.0 to 5.5 ft Medium stiff, gray and brown clayey SILT.
5.5 to 7.0 ft Stiff brown SILT; blocky relict siltstone structure, becomes slightly harder with depth.
7.0 to 9.0 ft Medium hard (RH-2) gray SILTSTONE.
Test pit terminated at a depth of 9 ft at practical refusal of the mini-excavator.
Groundwater seepage not observed.
Completed October 3, 2012.

Test Pit TP-2

0.0 to 1.0 ft FILL: Medium stiff, brown SILT with sandstone debris.
1.0 to 2.5 ft Medium stiff, black clayey SILT; highly expansive.
2.5 to 4.5 ft Soft (RH-1) brown SILTSTONE; blocky structure, becomes slightly harder with depth.
Test pit terminated at a depth of 4.5 ft at practical refusal of the mini-excavator.
Groundwater seepage not observed.
Completed October 3, 2012.

Test Pit TP-3

0.0 to 1.0 ft Medium stiff, black clayey SILT; highly expansive.
1.0 to 4.0 ft Medium stiff, gray and brown clayey SILT; moderately expansive.
4.0 to 6.0 ft Medium soft (RH-1) gray SILTSTONE.
Test pit terminated at a depth of 6 ft at practical refusal of the mini-excavator.
Groundwater seepage not observed.
Completed October 3, 2012.

Test Pit TP-4

0.0 to 2.0 ft FILL: Medium stiff, black clayey silt, highly expansive.
2.0 to 4.0 ft Medium stiff, black clayey SILT; highly expansive.
4.0 to 5.0 ft Soft (RH-1) brown SANDSTONE; blocky structure, becomes slightly harder with depth.
Test pit terminated at a depth of 5.0 ft at practical refusal of the mini-excavator.
Groundwater seepage not observed.
Completed October 3, 2012.

Test Pit TP-5

0.0 to 2.0 ft FILL: Medium stiff, black clayey silt, highly expansive.
2.0 to 3.5 ft Medium stiff, reddish-brown clayey SILT; moderately to highly expansive.
3.5 to 4.5 ft Soft (RH-1) brown SANDSTONE; blocky structure, becomes slightly harder with depth.
Test pit terminated at a depth of 4.5 ft at practical refusal of the mini-excavator.
Groundwater seepage not observed.
Completed October 3, 2012.

Test Pit TP-7

0.0 to 3.0 ft Medium stiff, black clayey SILT; highly expansive.
3.0 to 3.5 ft Medium soft (RH-1), brown SANDSTONE; moderately weathered.
Test pit terminated at a depth of 3.5 ft at practical refusal of the mini-excavator.
Groundwater seepage not observed.
Completed October 3, 2012.

Test Pit TP-8

0.0 to 0.5 ft Medium stiff, black clayey SILT; highly expansive.
0.5 to 3.5 ft Medium stiff, gray clayey SILT; highly expansive.
3.5 to 4.0 ft Medium stiff, mottled brown SILT; trace clay.
4.0 to 7.0 ft Soft (RH-1) brown SILTSTONE; blocky structure, becomes slightly harder with depth.
Test pit terminated at a depth of 7.0 ft.
Groundwater seepage not observed.
Completed October 3, 2012.

Test Pit TP-10

0.0 to 2.5 ft Medium stiff, black clayey SILT; highly expansive.
2.5 to 4.0 ft Soft to Medium Hard (RH-1 to RH-2) brown SANDSTONE; blocky structure, becomes harder with depth.
Test pit terminated at a depth of 4.0 ft at practical refusal of the mini-excavator.
Groundwater seepage not observed.
Completed October 3, 2012.

Test Pit TP-11

0.0 to 3.0 ft Medium stiff, black clayey SILT; highly expansive.
3.0 to 4.5 ft Soft to Medium Hard (RH-1 to RH-2) brown SANDSTONE; blocky structure, becomes harder with depth.
Test pit terminated at a depth of 4.5 ft at practical refusal of the mini-excavator.
Groundwater seepage not observed.
Completed October 3, 2012.

Test Pit TP-12

0.0 to 3.5 ft Medium stiff, black clayey SILT; highly expansive.
3.5 to 6.5 ft Soft to Medium Hard (RH-1 to RH-2) brown SANDSTONE; blocky structure.
6.5 to 7.0 ft Soft (RH-1) gray SILTSTONE?CLAYSTONE; close fractures, slightly weathered.
7.0 to 8.0 ft Medium Hard (RH-2) brown SANDSTONE; blocky structure
Test pit terminated at a depth of 8.0 ft.
Groundwater seepage not observed.
Completed October 3, 2012.

Test Pit TP-13

0.0 to 1.0 ft Medium stiff, black clayey SILT; highly expansive.
1.0 to 3.0 ft Medium stiff, brown SILT; relict sandstone structure.
3.0 to 4.0 ft Medium hard (RH-2), brown SANDSTONE; close fractures, moderately weathered.
Test pit terminated at a depth of 4.0 ft at practical refusal of the mini-excavator.
Groundwater seepage not observed.
Completed October 3, 2012.

Test Pit TP-15

0.0 to 2.0 ft Medium stiff, black clayey SILT; highly expansive.
2.0 to 4.0 ft Medium stiff, brown SILT; relict sandstone structure.
4.0 to 7.0 ft Medium soft (RH-1), brown SANDSTONE; local zones of hard (RH-3) sandstone, close fractures, moderately weathered.
Test pit terminated at a depth of 7.0 ft at practical refusal of the mini-excavator.
Groundwater seepage not observed.
Completed October 3, 2012.

Test Pit TP-16

0.0 to 3.0 ft Medium stiff, black clayey SILT; highly expansive.
3.0 to 3.5 ft Medium stiff, brown SILT; relict sandstone structure.
3.5 to 8.5 ft Medium soft (RH-1), gray and brown SILTSTONE; scattered hard cobble and boulders.
Test pit terminated at a depth of 8.5 ft.
Groundwater seepage not observed.
Completed October 3, 2012.

Test Pit TP-17

0.0 to 5.0 ft FILL: Medium stiff, brown clayey SILT with sandstone debris up to 3 ft in size.
5.0 to 7.0 ft Medium stiff, black clayey SILT; highly expansive.
7.0 to 12.0 ft Medium stiff, brown SILT; some clay, scattered sandstone pieces up to 2 ft in size (relict sandstone).
Test pit terminated at a depth of 12.0 ft.
Groundwater seepage not observed.
Completed October 3, 2012.

Soil Boring SB-20

0.0 to 3.0 ft Medium stiff, dark brown clayey SILT; moderately expansive.
3.0 to 4.2 ft Medium stiff, brown SILT; relict sandstone structure
SPT N-value of 50 for 2 in. at depth of 4.0 to 4.2 ft.
Boring terminated at practical refusal of drill rig at a depth of 4.2 ft.
Groundwater seepage not observed.
Completed April 22, 2013

Soil Boring SB-21

0.0 to 2.0 ft Medium stiff, dark brown clayey SILT; moderately expansive.
2.0 to 6.5 ft Medium soft (RH-1), brown SANDSTONE; weathering decreases with depth, hardness increases with depth, interbedded RH-1 and RH-2 sandstone below 5 ft.
SPT N-value of 13/50 for 12 in. at depth of 4.0 to 5.0 ft.
6.5 to 8.0 ft Medium hard (RH-2), brown SANDSTONE; severely weathered.
SPT N-value of 50 for 1 in. at depth of 8.0 ft.
Boring terminated at practical refusal of drill rig at a depth of 8.0 ft.
Groundwater seepage not observed.
Completed April 22, 2013

Soil Boring SB-22

0.0 to 0.5 ft Medium stiff, dark brown clayey SILT; moderately expansive.
Boring terminated at practical refusal of drill rig at a depth of 0.5 ft. The drill rig was moved approximately 5 ft north and attempted second boring. Second location also encountered refusal at a depth of 0.5 ft.
Groundwater seepage not observed.
Completed April 23, 2013

Soil Boring SB-23 (located at the edge of a fill slope)

0.0 to 2.5 ft Medium stiff, dark brown clayey SILT; moderately to highly expansive.
2.5 to 5.5 ft Medium stiff, brown clayey SILT; moderately expansive.
SPT N-value of 8/15/50 for 4 in. at depth of 4.0 to 5.2 ft.
5.5 to 9.0 ft Medium soft (RH-1), brown SANDSTONE; weathering decreases with depth, hardness increases with depth, interbedded RH-1 and RH-2 sandstone below 6 ft.
9.0 to 12.0 ft Medium hard (RH-2), brown SANDSTONE; severely weathered, local zones of medium soft (RH-1) sandstone.
Boring terminated at practical refusal of drill rig at a depth of 12.0 ft.
Groundwater seepage not observed.
Completed April 23, 2013

Soil Boring SB-24

0.0 to 3.0 ft Medium stiff, dark brown clayey SILT; moderately to highly expansive, desiccation cracks at ground surface.

3.0 to 5.5 ft Medium stiff, brown SILT; some clay, slightly expansive.

5.5 to 8.0 ft Medium soft (RH-1), light brown SANDSTONE; weathering decreases with depth, hardness increases with depth, interbedded RH-1 and RH-2 sandstone below 7 ft.

8.0 to 11.5 ft Medium hard (RH-2), brown SANDSTONE; severely weathered, local zones of medium soft (RH-1) sandstone, local zones of hard (RH-3) sandstone.

Boring terminated at practical refusal of drill rig at a depth of 11.5 ft.
Groundwater seepage not observed.
Completed April 23, 2013

Soil Boring SB-25

0.0 to 3.0 ft Medium stiff, dark brown clayey SILT; moderately to highly expansive.

3.0 to 4.5 ft Medium stiff, brown SILT; some clay, slightly expansive.

4.5 to 12.0 ft Medium soft (RH-1), light brown SANDSTONE; weathering decreases with depth, hardness increases with depth, interbedded RH-1 and RH-2 sandstone below 7 ft.
SPT N-value of 12/50 for 4 in. at depth of 8.0 to 8.7 ft.

Boring terminated at a depth of 12.0 ft.
Groundwater seepage not observed.
Completed April 22, 2013

Soil Boring SB-26

0.0 to 2.0 ft Medium stiff, dark brown clayey SILT; moderately to highly expansive.

2.0 to 5.0 ft Medium stiff, brown SILT; some clay, slightly expansive.
SPT N-value of 29/40/50 for 4 in. at depth of 4.0 to 5.2 ft.

5.0 to 12.0 ft Medium soft (RH-1), light brown SANDSTONE; weathering decreases with depth, hardness increases with depth, interbedded RH-1 and RH-2 sandstone below 7 ft.

Boring terminated at a depth of 12.0 ft.
Groundwater seepage not observed.
Completed April 22, 2013

Soil Boring SB-27

0.0 to 3.0 ft Medium stiff, dark brown clayey SILT; moderately to highly expansive.

3.0 to 4.5 ft Medium soft (RH-1), light brown SANDSTONE; hard sandstone at 4.5 ft.
SPT N-value of 50 for 6 in. at depth of 4.0 to 4.5 ft.

Boring terminated at practical refusal of drill rig a depth of 4.5 ft on hard (RH-2) sandstone.
Groundwater seepage not observed.
Completed April 22, 2013

Soil Boring SB-28

0.0 to 3.0 ft Medium stiff, dark brown clayey SILT; moderately to highly expansive.
3.0 to 7.0 ft Medium stiff, brown SILT; some clay, slightly expansive.
SPT N-value of 20/50 for 6 in. (cobble at 4.5 ft) at depth of 4.0 to 5.0 ft.
7.0 to 12.2 ft Medium soft (RH-1), light brown SANDSTONE; weathering decreases with depth, hardness increases with depth, interbedded RH-1 and RH-2 sandstone below 11 ft.
SPT N-value of 50 for 6 in. at depth of 8.0 to 8.5 ft.
SPT N-value of 50 for 3 in. at depth of 12.0 to 12.2 ft.
Boring terminated at practical refusal of the drill rig at a depth of 12.2 ft.
Groundwater seepage not observed.
Completed April 22, 2013

Soil Boring SB-29

0.0 to 3.0 ft Medium stiff, dark brown clayey SILT; moderately to highly expansive.
3.0 to 4.5 ft Medium stiff, brown SILT; some clay, slightly expansive.
SPT N-value of 14/50 for 3 in. at depth of 4.0 to 4.8 ft.
4.5 to 12.0 ft Medium soft (RH-1), light brown SANDSTONE; weathering decreases with depth, hardness increases with depth.
Boring terminated at a depth of 12 ft.
Groundwater seepage not observed.
Completed April 22, 2013

Soil Boring SB-30

0.0 to 3.5 ft Medium stiff, black clayey SILT; moderately to highly expansive.
3.5 to 5.5 ft Medium stiff, brown SILT; some clay, slightly expansive.
SPT N-value of 14/8/20 at depth of 4.0 to 5.5 ft.
5.5 to 12.0 ft Medium soft (RH-1), dark brown SANDSTONE; weathering decreases with depth, hardness increases with depth, local zones of RH-2 sandstone.
SPT N-value of 30/50 for 5 in. at depth of 8.0 to 8.9 ft.
Boring terminated at a depth of 12 ft.
Groundwater seepage not observed.
Completed April 22, 2013

Soil Boring SB-31 (Completed 30 ft west of staked location due to bushes)

0.0 to 2.5 ft Medium stiff, brown clayey SILT; moderately to highly expansive.
2.5 to 9.0 ft Medium stiff, brown SILT; some clay, slightly expansive.
SPT N-value of 13/35/20 at depth of 4.0 to 5.5 ft.
9.0 to 12.0 ft Medium soft (RH-1), dark brown SANDSTONE; weathering decreases with depth, hardness increases with depth, local zones of RH-2 sandstone.
Boring terminated at a depth of 12 ft.
Groundwater seepage not observed.
Completed April 23, 2013

TABLE 2A: ROCK DESCRIPTION TERMINOLOGY

Scale of Rock Hardness (After Panama Canal Company, 1959)

RH-1	Soft	Slightly harder than very hard over-burden, rock-like character, but crumbles or breaks easily by hand.
RH-1	Medium Soft	Cannot be crumbled between fingers but can be easily picked with light blows of the geology hammer.
RH-2	Medium Hard	Can be picked with moderate blows of geology hammer. Can be cut with knife.
RH-3	Hard	Cannot be picked with geology hammer but can be chipped with moderate blows of the hammer.
RH-4	Very Hard	Chips can be broken off only with heavy blows of the geology hammer.

Terms Used to Describe the Degree of Weathering

Descriptive Term	Defining Characteristics
Fresh	Rock is unstained. May be fractured but discontinuities are not stained.
Slight	Rock is unstained. Discontinuities show some staining on their surface but discoloration does not penetrate rock mass.
Moderate	Discontinuity surfaces are stained. Discoloration may extend into rock along discontinuity surfaces.
High	Individual rock fragments are thoroughly stained and can be crushed with pressure hammer. Discontinuous surfaces are thoroughly stained and may be crumbly.
Severe	Rock appears to consist of gravel-sized fragments in a "soil" matrix. Individual fragments are thoroughly discolored and can be broken with fingers.

Thickness of Bedding

Massive	Beds are 3 feet thick or greater.
Thick Bedding	Beds from 1 to 3 feet thick.
Medium Bedded	Beds from 4 inch to 1 feet thick.
Thin Bedded	Beds less than 4 inch thick.

TABLE 1A: SOIL DESCRIPTION TERMINOLOGY

Coarse-Grained Soils (Sand Size and Larger)

Relative Density	Standard Penetration Resistance (N-Values)
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Fine-Grained (Cohesive) Soils

Consistency	Standard Penetration Resistance (N-Value)	Torvane Undrained Shear Strength, tsf	Field Identification
Very Soft	2	Less than 0.125	• Easily penetrated by fist.
Soft	2-4	0.125-0.25	• Easily penetrated by thumb.
Medium Stiff	5-8	0.25-0.50	• Penetrated by thumb with moderate effort.
Stiff	9-15	0.50-1.0	• Readily indented by thumb but penetrated only with great effort.
Very Stiff	16-30	1.0-2.0	• Readily indented by thumbnail.
Hard	Over 30	Over 2.0	• Indented with difficulty by thumbnail.

Grain Shape

Term	Description
Angular	Corners and edges sharp.
Subangular	Corners worn off, angles not worn off
Subrounded	Corners and angles worn off, flat surfaces remain.
Rounded	Worn to almost spherical shape.

Grain Size Classification

Boulders	6 to 36 inches
Cobbles	3 to 6 inches
Gravel	¼-¾ inch (fine)
	¾-3 inches (coarse)
Sand	No. 200-No. 40 sieve (fine)
	No. 40-No. 10 sieve (medium)
	No. 10-No. 4 sieve (coarse)
Silt/Clay	Pass No. 200 sieve

Modifier for Subclassification

Adjective	Percentage of Other Material in Total Sample
Clean	0 – 1.5
Trace	1.5 - 10
Some	10 - 30
Sandy, Silty, or Clayey	30 - 50